



6712-01

FEDERAL COMMUNICATIONS COMMISSION

47 CFR Part 54

[WC Docket No. 10-90; DA 18-710]

Connect America Fund

AGENCY: Federal Communications Commission.

ACTION: Final action.

SUMMARY: In this document, the Wireline Competition Bureau (WCB), the Wireless Telecommunications Bureau (WTB) (jointly referred to herein as the Bureaus), and the Office of Engineering and Technology (OET) adopt requirements promoting greater accountability for certain recipients of Connect America Fund (CAF) high-cost universal service support, including price cap carriers, rate-of-return carriers, rural broadband experiment (RBE) support recipients, Alaska Plan carriers, and CAF Phase II auction winners. Specifically, the Bureaus and OET establish a uniform framework for measuring the speed and latency performance for recipients of high-cost universal service support to serve fixed locations.

DATES: This final action is effective **[INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**.

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SUPPLEMENTARY INFORMATION: This is a summary of the Commission's Order in WC Docket No. 10-90; DA 18-710, adopted on July 6, 2018 and released on July 6, 2018. The full text of this document is available for public inspection during regular business hours in the FCC Reference Center, Room CY-A257, 445 12th Street S.W., Washington, D.C. 20554 or at the following Internet address: <https://docs.fcc.gov/public/attachments/DA-18-710A1.pdf>.

I. INTRODUCTION

1. In the Order, the Bureaus and OET adopt requirements promoting greater accountability

for certain recipients of CAF high-cost universal service support, including price cap carriers, rate-of-return carriers, RBE support recipients, Alaska Plan carriers, and CAF Phase II auction winners.

Specifically, the Bureaus and OET establish a uniform framework for measuring the speed and latency performance for recipients of high-cost universal service support to serve fixed locations.

2. The Bureaus and OET also require providers to submit testing results as part of their annual compliance certification. Carriers that do not comply with the Bureaus and OET's speed and latency requirements will be subject to a reduction in support, commensurate with their level of noncompliance. In addition, providers will be subject to audit of all testing data. With this testing and compliance framework, the Bureaus and OET aim to maximize the benefits consumers reap from its high-cost universal service programs in even the hardest-to-reach areas, thus making the best use of its Universal Service Fund (USF) dollars and further closing the digital divide.

II. CHOICE OF TESTING METHOD

3. The Bureaus and OET provide high-cost support recipients that serve fixed locations three options to afford flexibility in choosing solutions to conduct required performance testing. Specifically, the Bureaus and OET conclude that eligible telecommunications carriers (ETCs) subject to fixed broadband performance obligations may conduct required testing by employing either (1) Measuring Broadband America (MBA) testing infrastructure (MBA testing), (2) existing network management systems and tools (off-the-shelf testing), or (3) provider-developed self-testing configurations (provider-developed self-testing or self-testing). Providers may employ any of these three options as long as the provider's implementation meets the testing requirements established in this Order. The Bureaus and OET define the three options as follows:

- First, a high-cost support recipient may use MBA testing by arranging with entities that manage and perform testing for the MBA program to implement performance testing, as required, for CAF. The provider is responsible for all costs required to implement testing of its network, including any costs associated with obtaining and maintaining Whiteboxes, to the extent that any additional Whiteboxes are employed as part of the MBA testing. The Bureaus

and OET note that the MBA testing must occur in areas and for the locations supported by CAF, e.g., in CAF Phase II eligible areas for price cap carriers and for specific built-out locations for RBE, Alternative Connect America Cost Model (A-CAM), and legacy rate-of-return support recipients.

- Second, a high-cost support recipient may elect to use existing network management systems and tools, ping tests, and other commonly available performance measurement and network management tools – off-the-shelf testing – to implement performance testing.
- Third, a high-cost support recipient may implement a provider-developed self-testing configuration using software installed on residential gateways or in equipment attached to residential gateways to regularly initiate speed and latency tests. Providers that implement self-testing of their own networks may make network performance testing services available to other providers. The Bureaus and OET continue to consider whether the Universal Service Administrative Company (USAC) may have a role in offering server capacity at an Internet Exchange Point in an FCC-designated metropolitan area (FCC-designated IXP), without any oversight role in conducting tests, to mitigate smaller providers' costs.

4. By providing these three options, the Bureaus and OET ensure that there is a cost-effective method for conducting testing for providers of different sizes and technological sophistication. The Bureaus and OET do not require that providers invest in and implement new internal systems; instead, providers may perform speed and latency tests with readily-available, off-the-shelf solutions or existing MBA infrastructure. On the other hand, some providers may prefer implementing their own self-testing systems, especially if such testing features are already built into CPE for the carrier's own network management purposes. These three options allow the provider to align required performance testing with their established network management systems and operations, making it as easy as possible for carriers to implement the required testing while establishing rigorous testing parameters and standards, based on real-world data.

5. The Bureaus and OET recognize that self-testing using provider-developed software may create opportunities for “manipulation or gaming” by CAF recipients. However, the Bureaus and OET believe that the testing and compliance requirements they adopt will minimize the possibility of such behavior. First, as explained in more detail in the following, the Bureaus and OET will be requiring providers to submit and certify testing data annually. Second, USAC will be verifying provider compliance and auditing performance testing results.

6. The Bureaus and OET reject Alaska Communications’ proposal that high-cost support recipients may submit radio frequency propagation maps in lieu of conducting speed tests to demonstrate compliance with speed obligations. Such maps are only illustrative of planned, “theoretical” coverage and do not provide actual data on what consumers experience. The Bureaus and OET therefore require providers to conduct the required testing using one of the three options identified in this document.

III. GENERAL TESTING PARAMETERS

7. All ETCs subject to fixed broadband performance obligations must conduct the required speed and latency testing using the parameters in this Order, regardless of which of the three testing options the carrier selects. The Bureaus and OET first define “test” and the associated span of measurement, in the context of these performance measurements. Next, the Bureaus and OET adopt requirements regarding when tests must begin and when exactly carriers may perform the tests, and they set the number of active subscriber locations carriers must test, with variations depending on the size of the carrier. Finally, the Bureaus and OET address how high-latency bidders in the CAF Phase II auction must conduct required voice testing.

8. To maintain a stringent performance compliance regime while avoiding unnecessary burdens on smaller carriers, the Bureaus and OET allow flexibility concerning the specific testing approach so that carriers can select, consistent with its adopted framework, the best and most efficient testing methods for their particular circumstances. The Bureaus and OET encourage the use of industry testing standards, such as the TR-143 Standard, for conducting self-testing.

9. For reasons similar to those outlined in the CAF Phase II Price Cap Service Obligation

Order, 78 FR 70881, November 27, 2013, the Bureaus and OET require that high-cost support recipients serving fixed locations perform these tests over the measurement span already applicable to price cap carriers receiving CAF Phase II model-based support. ETCs must test speed and latency from the customer premises of an active subscriber to a remote test server located at or reached by passing through an FCC-designated IXP. Accordingly, a speed test is a single measurement of download or upload speed of 10 to 15 seconds duration between a specific consumer location and a specific remote server location. Similarly, a latency test is a single measurement of latency, often performed using a single User Datagram Protocol (UDP) packet or a group of three Internet Control Message Protocol (ICMP) or UDP packets sent at essentially the same time, as is common with ping tests.

10. Large and small ETCs alike commit to providing a certain level of service when accepting high-cost support to deploy broadband. “Testing . . . on only a portion of the network connecting a consumer to the Internet core will not show whether that customer is able to enjoy high-quality real-time applications because it is network performance from the customer’s location to the destination that determines the quality of the service from the customer’s perspective.” Although the measurement span the Bureaus and OET adopt may include transport (e.g., backhaul or transit) that a provider does not control, the carrier can influence the quality of transport purchased and can negotiate with the transport provider for a level of service that will enable it to meet the Commission’s performance requirements. This is true for both price cap carriers and smaller carriers. The Bureaus and OET therefore disagree with suggestions that testing should only occur within a provider’s own network because providers do not always control the portion of the network reaching the nearest FCC-designated IXP.

11. Previously, the Bureaus and OET designated the following ten locations as FCC-designated IXPs: New York City, NY; Washington, DC; Atlanta, GA; Miami, FL; Chicago, IL; Dallas-Fort Worth, TX; Los Angeles, CA; San Francisco, CA; Seattle, WA; and Denver, CO. All of these areas, except Denver, are locations used by the MBA program, which selected these locations because they are geographically distributed major U.S. Internet peering locations. Denver was added to the list so that all

contiguous areas in the United States are within 700 miles of an FCC-designated IXP. Because the Bureaus and OET are expanding testing to additional CAF recipients, they add the following six metropolitan areas as additional FCC-designated IXPs: Salt Lake City, UT; St. Paul, MN; Helena, MT; Kansas City, MO; Phoenix, AZ; and Boston, MA. This expanded list ensures that most mainland U.S. locations are within 300 air miles of an FCC-designated IXP, and all are within approximately 500 air miles of one. Further, the Bureaus and OET find that there is no reason to limit testing to the provider's nearest IXP; rather, providers can use any FCC-designated IXP for testing purposes.

12. Still, the Bureaus and OET recognize that non-contiguous providers face unique challenges in providing service outside the continental U.S. The distance between a carrier and its nearest IXP affects latency and may affect speed as well. At this time, the Bureaus and OET do not have sufficient data to determine the extent of the effect of distance on speed performance testing. Therefore, similar to the existing exception for non-contiguous price cap carriers accepting model-based CAF Phase II support, the Bureaus and OET permit all providers serving non-contiguous areas greater than 500 air miles from an FCC-designated IXP to conduct all required latency and speed testing between the customer premises and the point at which traffic is aggregated for transport to the continental U.S. The Bureaus and OET have identified a sufficient number of IXPs so that no point in the continental U.S. is more than approximately 500 miles from an FCC-designated IXP. Therefore, allowing non-contiguous providers located more than 500 miles from an FCC-designated IXP to test to the point in the non-contiguous area where traffic is aggregated for transport to the mainland will prevent these providers from being unfairly penalized for failing to meet their performance obligations solely because of the location of the areas being served. However, as the Commission gains additional MBA and other data on speed and latency from non-contiguous areas, the Bureaus and OET may revisit this conclusion.

13. First, the Bureaus and OET establish the specific test intervals within the daily test period. For latency, the Bureaus and OET require a minimum of one discrete test per minute, i.e., 60 tests per hour, for each of the testing hours, at each subscriber test location, with the results of each discrete test recorded separately. The Bureaus and OET note that intensive consumer use of the network (such as

streaming video) during testing, referred to as cross-talk, can influence both consumer service and testing results. The data usage load for latency testing is minimal; sending 60 UDP packets of 64 bytes each in one hour is approximately 4,000 bytes in total. However, to prevent cross-talk from negatively affecting both the consumer experience and test results, the Bureaus and OET adopt consumer load thresholds—i.e., cross-talk thresholds—similar to those used by the MBA program. Accordingly, for latency testing, if the consumer load exceeds 64 Kbps downstream, the provider may cancel the test and reevaluate whether the consumer load exceeds 64 Kbps downstream before retrying the test in the next minute. Providers who elect to do more than the minimum required number of latency tests at subscriber test locations must include the results from all tests performed during testing periods in their compliance calculations.

14. For speed, the Bureaus and OET require a minimum of one download test and one upload test per testing hour at each subscriber test location. The Bureaus and OET note that speed testing has greater network impact than latency testing. For speed testing, the Bureaus and OET require providers to start separate download and upload speed tests at the beginning of each test hour window. As with latency, the Bureaus and OET adopt cross-talk thresholds similar to those used in the MBA program. If the consumer load is greater than 64 Kbps downstream for download tests or 32 Kbps upstream for upload tests, the provider may defer the affected download or upload test for one minute and reevaluate whether the consumer load exceeds the relevant 64 Kbps or 32 Kbps threshold before retrying the test. This load check-and-retry must continue at one-minute intervals until the speed test can be run or the one-hour test window ends and the test for that hour is canceled. Also as with latency, providers who elect to do more than the minimum required number of speed tests at subscriber test locations must include the results from all tests performed during testing periods for compliance calculations.

15. Second, to capture any seasonal effects on a carrier's broadband performance, the Bureaus and OET require that carriers subject to the latency and speed testing requirements conduct one week of testing in each quarter of the calendar year. Specifically, carriers must conduct one week of testing in each of the following quarters: January through March, April through June, July through

September, and October through December. By requiring measurements quarterly, rather than in four consecutive weeks, the Bureaus and OET expect test results to reflect a carrier's performance throughout the year, including during times of the year in which there is a seasonal increase or decrease in network usage. Although previously WCB required price cap carriers receiving CAF Phase II support to test latency for two weeks each quarter, the Bureaus and OET find that requiring testing one week each quarter strikes a better balance of accounting for seasonal changes in broadband usage and minimizing the burden on consumers who may participate in testing.

16. Third, in establishing the daily testing period, the Bureaus and OET slightly expand the test period and require that carriers conduct tests between 6:00 pm and 12:00 am (testing hours), including on weekends. The Bureaus and OET continue to find that MBA data supports its conclusion that there is a peak period of Internet usage every evening. However, the Bureaus and OET intend to revisit this requirement periodically to determine whether peak Internet usage times have changed substantially.

17. The Bureaus and OET conclude that requiring measurements over an expanded period, by including one hour before the peak period and one hour after, will best ensure that carriers meet the speed and latency obligations associated with the high-cost support they receive. MBA data shows that broadband Internet access service providers that perform well during the peak period tend to perform well consistently throughout the day. Further, the Bureaus and OET required schedule of testing is consistent with the specific, realistic standards they set forth which were developed using MBA peak-period data. Thus, the Bureaus and OET will be judging testing hours data based on a standard developed using MBA data from the same time period.

18. Additionally, the Bureaus and OET disagree with assertions that requiring speed testing during the peak period will introduce problematic network congestion over the provider's core network. Based on MBA speed test data, a download service speed test for 10 Mbps requires approximately 624 MB combined downloaded data for 50 locations per hour. This is less traffic than what would be generated by streaming a little less than one-half of a high-definition movie. A download service speed

test for 25 Mbps requires approximately 1,841 MB combined downloaded data for 50 locations, which is about the same amount of traffic as a little less than two high-definition movies. The small amount of data should have no noticeable effect on network congestion. Upload test data-usage is even lower. Based upon MBA speed test data, a one-hour upload service speed test for 1 Mbps and 3 Mbps for 50 locations will be approximately 57 MB and 120 MB, respectively. This testing will use bandwidth equivalent to uploading 12 photos to a social media website at 1 Mbps or 24 photos at 3 Mbps. To the extent that a carrier is concerned about possible impacts on the consumer experience, the Bureaus and OET permit carriers the flexibility to choose whether to stagger their tests, so long as they do not violate any other testing requirements, as they explain in their discussion of the testing intervals in the following.

19. Fourth, testing for all locations in a single speed tier in a single state must be done during the same week. If a provider has more than one speed tier in a state, testing for each speed tier can be conducted during different weeks within the quarter. For a provider serving multiple states, testing of each service tier does not need to be done during the same week, i.e., a provider may test its 10/1 Mbps customers in New York one week and in Pennsylvania during a different week. The Bureaus and OET will generally consider requests for waiver or extension in cases where a major, disruptive event (e.g., a hurricane) negatively affects a provider's broadband performance. However, prior to requesting a waiver, providers should determine whether rescheduling testing within the 3-month test window will be sufficient to handle the disruptive event.

20. The Bureaus and OET require that carriers test up to 50 locations per CAF-required service tier offering per state, depending on the number of subscribers a carrier has in a state. The subscribers eligible for testing must be at locations that are reported in the HUBB where there is an active subscriber. The Bureaus and OET decline to adopt a simple percentage-based alternative but, instead, adopt the following scaled requirements for each state and service tier combination for a carrier:

Required Test Locations for Speed

| Number of Subscribers at CAF-Supported Locations per State and Service Tier Combination | Number of Test Locations |
|--|---------------------------------|
| 50 or fewer | 5 |
| 51–500 | 10% of total subscribers |
| Over 500 | 50 |

The Bureaus and OET recognize that it is possible that a carrier serving 50 or fewer subscribers in a state and particular service tier cannot find the required number of five active subscribers for testing purposes. To the extent necessary, the Bureaus and OET permit such carriers to test existing, non-CAF-supported active subscriber locations within the same state and service tier to satisfy its requirement of testing five active subscriber locations. Carriers may voluntarily test the speed and/or latency of additional randomly selected CAF-supported subscribers over the minimum number of required test locations as part of their quarterly testing. However, data for all tested locations must be submitted for inclusion in the compliance calculations, i.e., carriers must identify the set of testing locations at the beginning of the testing and cannot exclude some locations during or after the testing.

21. Carriers must test an adequate number of subscriber locations to provide a clear picture of the carrier's performance and its customers' broadband experience across a state. The Bureaus and OET find that 50 test locations, per speed tier per state, remains a good indicator as to whether providers are fulfilling their obligations. A sample size of 50 test locations out of 2,500 or more subscribers provides a picture of carriers' performance with a ± 11.5 percent margin of error and 90 percent confidence level. Testing 50 locations out of more than 500 subscribers yields a comparable picture of carriers' performance. The Bureaus and OET acknowledge, however, that smaller carriers may find testing 50

locations burdensome. Below 2,500 CAF-supported subscribers, greater percentages of subscribers are necessary to achieve the same margin of error and confidence level, but below 500 subscribers the necessary percentage rises quickly above 10 percent. Carriers serving fewer subscribers would thus be unable to provide test results achieving the same margin of error and confidence level without testing a more proportionately burdensome percentage of their subscribers.

22. The Bureaus and OET also now find it preferable to use the number of subscribers in a state and service tier, rather than the number of lines for which a provider is receiving support, to determine the required number of test locations. A carrier receiving support for 2,000 lines serving 100 subscribers would find it much more difficult to test 50 active subscriber locations, compared to a carrier receiving support for 2,000 lines but serving 1,500 subscribers, and commenters have noted that providers may find it difficult to find a sufficient number of locations if they have relatively few subscribers. Basing the number of locations to be tested on the number of subscribers, rather than the number of lines, addresses this concern.

23. The Bureaus and OET therefore require testing a specific number of subscribers for carriers serving more than 500 subscribers in a single service tier and state, but require carriers serving between 51 and 500 subscribers in a single service tier and state to test a fixed percentage of subscribers. For carriers serving 50 or fewer subscribers in a state and service tier, a percentage-based alternative may be insufficient; in an extreme situation, data from a single subscriber cannot clearly demonstrate a carrier's speed and latency performance. Accordingly, the Bureaus and OET require those providers to test a specific number of active subscriber locations. The Bureaus and OET conclude that this scaled approach balances the need to test a reasonable number of subscriber locations within a state based on the total number of subscribers and performance tiers with minimizing the burden on smaller providers to find consumer locations to be tested. The Bureaus and OET note, also, that a carrier receiving different types of CAF funding in the same state should aggregate its customers in each speed tier for purposes of testing. The following examples illustrate how this scaled approach should be implemented:

- A carrier with 2,300 customers subscribed to a single service tier of 10/1 Mbps in one state

must test 50 locations in that state, while a carrier providing solely 25/3 Mbps service to over 2,500 subscribers in each of three states must test 50 locations in each state.

- A carrier providing 10/1 Mbps service and 25/3 Mbps service to 100 subscribers each in a single state must test 10 locations for each of the two service tiers—20 locations in total.
- A carrier providing solely 10/1 Mbps service to 30 subscribers must test five locations, and if that carrier is only able to test three CAF-supported locations, that carrier must test two non-CAF-supported locations receiving 10/1 Mbps service in the same state.
- A carrier with 2,000 customers subscribed to 10/1 Mbps in one state through CAF Phase II funding and 500 RBE customers subscribed to 10/1 Mbps in the same state, and no other high-cost support with deployment obligations, must test a total of 50 locations in that state for the 10/1 Mbps service tier.

24. Test subjects must be randomly selected every two years from among the provider's active subscribers in each service tier in each state. Subscribers for latency testing may be randomly selected from those subscribers being tested for speed at all speed tiers or randomly selected from all CAF-supported subscribers, every two years. Any sample location lacking an active subscriber 12 months after that location was selected must be replaced by an actively subscribed location, randomly selected. Random selection will ensure that providers cannot pick and choose amongst subscribers so that only those subscribers likely to have the best performance (e.g., those closest to a central office) are tested. Carriers may use inducements to encourage subscribers to participate in testing. This may be particularly useful in cases where support is tied to a particular performance level for the network but the provider does not have enough subscribers to higher performance service to test to comply with the testing sample sizes. However, to ensure that the selection remains random, carriers must offer the same inducement to all randomly-selected subscribers in the areas for which participating subscribers are required for the carrier to conduct testing. WCB will provide further guidance regarding random selection by public notice.

25. The Bureaus and OET reiterate the Commission’s requirement that high-latency providers subject to testing must demonstrate a Mean Opinion Score (MOS) of four or higher. The Bureaus and OET agree with ADTRAN, Inc. (ADTRAN) that listening-opinion tests would not suffice to demonstrate a high-quality consumer voice experience. Latency only minimally affects participants’ experiences and evaluations in listening-opinion tests, which involve passive listening to audio samples. However, in the USF/ICC Transformation Order, 76 FR 73830, November 29, 2011, the Commission required “ETCs to offer sufficiently low latency to enable use of real-time applications, such as VoIP.” Unlike a listening-opinion test, in a conversation-opinion test, two participants actively participate in a conversation. The back-and-forth of conversations highlights delay, echo, and other issues caused by latency in a way that one-way, passive listening cannot. Therefore, the Bureaus and OET require that high-latency providers conduct an ITU-T Recommendation P.800 conversational-opinion test.

26. Specifically, the Bureaus and OET require the use of the underlying conversational-opinion test requirements specified by the ITU-T Recommendation P.800, with testing conditions as described in the following. The Bureaus and OET believe that MOS testing under these conditions will ensure that the test results reflect the consumer experience as accurately as possible. First, high-latency providers must use operational network infrastructure, such as actual satellite links, for conducting MOS testing, not laboratory-based simulations intended to reproduce service conditions. Second, the tests must be implemented using equipment, systems, and processes that are used in provisioning service to locations funded by high-cost universal service support. Third, live interviews and surveys must be conducted by an independent agency or organization (Reviewer) to determine the MOS. Survey forms, mail-in documentation, automated phone calls, or other non-interactive and non-person-to-person interviews are not permitted. Any organization or laboratory with experience testing services for compliance with telecommunications industry-specified standards and, preferably, MOS testing experience, may be a Reviewer. Fourth, testing must be conducted over a “single hop” satellite connection with at least one endpoint at an active subscriber location using the subscriber’s end-user equipment. Finally, the second endpoint may be a centralized location from which the Reviewer conducts

live interviews with the subscriber to determine the subscriber's MOS evaluation.

27. To reduce the burden of the MOS testing for high-latency bidders while still ensuring high-quality voice service, the Bureaus and OET adopt a separate scaled table for the number of locations that are subject to MOS testing. Specifically, the Bureaus and OET will determine the number of testing locations based upon the number of subscribers nationally for which CAF-supported service is provided. The Bureaus and OET recognize that the satellite infrastructures employed by many high-latency bidders have characteristics different from terrestrial networks that make testing of satellite service on a national, rather than state, basis appropriate. That is, middle-mile/backhaul for satellite networks are the direct links from the consumer locations to the satellite and then from the satellite to selected downlink sites, so there is unlikely to be significant variability based on the state in which the subscriber is located. The consumers must be randomly selected from the total CAF-supported subscriber base in all applicable states to ensure that different types of geographic locations are tested.

Required Test Locations for MOS Testing

| Number of Subscribers at CAF-Supported Locations Nationally | Number of MOS Test Locations |
|--|-------------------------------------|
| 3500 or fewer | 100 |
| Over 3500 | 370 |

This scaled, nationwide testing requirement will reduce high-latency bidders' testing burden while ensuring a sufficient testing sample to verify compliance with voice performance requirements.

IV. COMPLIANCE FRAMEWORK

28. The Bureaus and OET extend the existing standard for full compliance with high-cost support recipients' latency obligations and adopt a standard for full compliance with speed obligations. The Bureaus and OET also establish a compliance framework outlining specific actions for various degrees of compliance that fall short of those standards.

29. The Bureaus and OET reaffirm the existing low-latency and high-latency standards and establish a speed standard for full compliance. The data on round-trip latency in the United States has not markedly changed since the 2013 CAF Phase II Price Cap Service Obligation Order, and no party has challenged the Commission's reasoning for the existing 100 ms latency standard. Accordingly, the Bureaus and OET conclude that all high-cost support recipients serving fixed locations, except those carriers submitting high-latency bids in the CAF Phase II auction, must certify that 95 percent or more of all testing hours measurements of network round-trip latency are at or below 100 ms. High-latency bidders must certify that 95 percent or more of all testing hours measurements are at or below 750 ms. Providers must record the observed latency for all latency test measurements, including all lost packet tests. Thus, providers may not discard lost-packet tests from their test results; these tests count as discrete tests not meeting the standard.

30. For speed, the Bureaus and OET require that 80 percent of download and upload measurements be at or above 80 percent of the CAF-required speed tier (i.e., an 80/80 standard). For example, if a carrier receives high-cost support for 10/1 Mbps service, 80 percent of the download speed measurements must be at or above 8 Mbps, while 80 percent of the upload speed measurements must be at or above 0.8 Mbps. The Bureaus and OET require carriers to meet and test to their CAF obligation speed(s) regardless of whether their subscribers purchase Internet service offerings with advertised speeds matching the CAF-required speeds at CAF-eligible locations. Thus, carriers that have deployed a network with the requisite speeds must include all subscribers at that level in their testing, but may still find it necessary to upgrade individual subscriber locations, at least temporarily, to conduct speed testing. For example, a carrier may be required to deploy and offer 100/20 Mbps service, but only 5 of its 550 subscribers at CAF-supported locations take 100/20 Mbps service, with the remainder taking 20/20 Mbps service. To satisfy its testing obligations, the carrier would be required to (1) test all 5 of the 100/20 Mbps subscribers and (2) randomly select 45 of its other CAF-supported subscribers, raise those subscribers' speed to 100/20 Mbps, at least temporarily, and test those 45 subscribers.

31. The Bureaus and OET believe that this standard best meets its statutory requirement to

ensure that high-cost-supported broadband deployments provide reasonably comparable service as those available in urban areas. The most recent MBA report cites the 80/80 standard as a “key measure” of network consistency. MBA data show that all fixed terrestrial broadband technologies that are included in the MBA program can meet this standard. The Bureaus and OET are confident that high-cost support recipients’ newer fixed broadband deployments will benefit from more up-to-date technologies and network designs that should provide even better performance.

32. Further, the Bureaus and OET expect that a realistic 80/80 standard will provide a “cushion” to address certain testing issues. The Bureaus and OET noted in this document that some commenters expressed concern that they would be responsible for testing to an IXP even though that involved the use of backhaul that a provider may not control. The Bureaus and OET believe that the 80/80 standard allows sufficient leeway to providers so that they will meet performance standards as long as they have reasonable backhaul arrangements. In addition, commenters have raised a concern that speed testing could possibly show misleadingly low results if the subscriber being tested is using the connection at the time of the testing. However, the testing methodology addresses this concern. As with the MBA, the Bureaus and OET allow rescheduling of testing in instances where the customer usage exceeds MBA cross-talk thresholds. Thus, the Bureaus and OET do not anticipate that customer cross-talk will affect CAF performance data any more (or less) than the MBA program data on which its standard is based. Customer usage should not prevent carriers with appropriately constructed networks from meeting its requirements.

33. The Bureaus and OET find that a speed standard similar to what they have adopted for latency to measure broadband speed performance, as proposed by ADTRAN, is not appropriate. Staff analysis has found that this standard would not ensure CAF-supported service that is comparable to that in urban areas. The 2016 MBA Report stated that “[c]onsistency of speed may be more important to customers who are heavy users of applications that are both high bandwidth and sensitive to short duration declines in actual speed, such as streaming video.” A speed standard relying on an average or median value would not ensure consistency of speed because the distribution of values around the median

may vary significantly. A carrier could meet such a standard by ensuring that the average or median speed test meets a target speed, while not providing sufficiently fast service nearly half the time or to nearly half its subscribers in locations supported by universal service. The Bureaus and OET therefore conclude that the 80/80 standard they adopt herein is a better measure of comparability and high-quality service.

34. Finally, the Bureaus and OET recognize that, because of technical limitations, it is currently unrealistic to expect that providers obligated to provide gigabit service, i.e., speeds of 1,000 Mbps, achieve actual speeds of 1,000 Mbps download at the customer premises. Typical customer premises equipment, including equipment for gigabit subscribers, permits a maximum throughput of 1 Gbps, and the overhead associated with gigabit Internet traffic (whether in urban or rural areas) can reach up to 60 Mbps out of the theoretical 1 Gbps. Customer premises equipment with higher maximum throughput are generally more costly and not readily available. Thus, even if a gigabit provider were to “overprovision” its gigabit service, the subscriber would not experience speeds of 1,000 Mbps. The Bureaus and OET do not want to discourage carriers from bidding in the upcoming CAF auction to provide 1 Gbps service by requiring unachievable service levels. The Bureaus and OET note that the 80/80 standard they adopt requires gigabit carriers to demonstrate that 80 percent of their testing hours download speed tests are at or above 80 percent of 1,000 Mbps, i.e., 800 Mbps. This standard should not pose a barrier to carriers bidding to provide 1 Gbps service.

35. Consistent with the Commission’s universal service goals, the Bureaus and OET adopt a compliance framework that encourages ETCs to comply fully with their performance obligations and includes the potential for USAC to audit test results. The Bureaus and OET establish a four-level framework that sets forth particular obligations and automatic triggers based on an ETC’s degree of compliance with its latency, speed, and, if applicable, MOS testing standards in each state and high-cost support program. The Bureaus and OET will determine a carrier’s compliance for each standard separately. In each case, the Bureaus and OET will divide the percentage of its measurements meeting the relevant standard by the required percentage of measurements to be in full compliance.

36. In other words, for latency, in each state in which the carrier has CAF-supported locations, the Bureaus and OET will calculate the percentage of compliance using the 95-percent standard, so they will divide the percentage of the carrier's testing hours' latency measurements at or below the required latency (i.e., 100 ms or 750 ms) by 95. As an example, if a low-latency provider observes that 90 percent of all its testing hours measurements are at or below 100 ms, then that provider's latency compliance percentage would be $90/95 = 94.7$ percent in that state. For speed, for each speed tier and state the Bureaus and OET will calculate the percentage of compliance relative to the 80-percent-based standard, so they will divide the percentage of the carrier's testing hours speed measurements at or above 80 percent of the target speed by 80. Thus, if a provider observes that 65 percent of its testing hours speed measurements meet 80 percent of the required speed, the provider's compliance percentage would be $65/80 = 81.25$ percent for the relevant speed tier in that state. Carriers must include and submit the results from all tests and cannot exclude any tests conducted beyond the minimum numbers of tests, as outlined in this Order, for the calculation of latency and speed compliance percentages.

37. For MOS testing, the high-latency bidder must demonstrate a MOS of 4 or higher, so a high-latency bidder would calculate its percentage of compliance relative to 4. Thus, a provider demonstrating a MOS of 3 would have a compliance percentage of $3/4 = 75$ percent. For a high-latency bidder conducting MOS testing across its entire network, rather than state-by-state, the Bureaus and OET will calculate the same MOS compliance percentage for each state that it serves with CAF Phase II support.

38. To avoid penalizing a provider for failing to meet multiple standards for the same locations, the Bureaus and OET adopt a streamlined compliance framework in which the lowest of a carrier's separate latency, speed, and, if applicable, MOS compliance percentages (including percentages for each speed tier) determines its obligations. All carriers not fully compliant in a particular state must submit quarterly reports providing one week of testing hours test results, subject to the same requirements the Bureaus and OET establish in this Order, and describing steps taken to resolve the compliance gap, and USAC will withhold a percentage of a non-compliant carrier's monthly support. Whenever a carrier

in Levels 1 through 3 comes into a higher level of compliance, that level's requirements will apply, and USAC will return the withheld support up to an amount reflecting the difference between the levels' required withholding but not including any support withheld by USAC for more than 12 months.

39. The Bureaus and OET define Level 1 compliance to include carriers with compliance percentages at or above 85 but below 100 percent, and they direct USAC to withhold 5 percent of a Level 1-compliant carrier's monthly support. Level 2 compliance includes carriers with compliance percentages at or above 70 but below 85 percent, and the Bureaus and OET direct USAC to withhold 10 percent of a Level 2-compliant carrier's monthly support. Level 3 compliance includes carriers with compliance percentages at or above 55 but below 70 percent, and the Bureaus and OET direct USAC to withhold 15 percent of a Level 3-compliant carrier's monthly support. Level 4 compliance includes carriers with compliance percentages below 55 percent, and the Bureaus and OET direct USAC to withhold 25 percent of a Level 4-compliant carrier's monthly support. The Bureaus and OET will also refer Level 4-compliant carriers to USAC for an investigation into the extent to which the carrier has actually deployed broadband in accordance with its deployment obligations. The following table provides a summary of the compliance framework, where x is the carrier's compliance percentage:

Compliance Levels and Support Reductions

| | Qualifying Compliance Percentage x | Required Quarterly Reporting | Monthly Support Withheld |
|------------------------|--|---|-------------------------------------|
| Full Compliance | $x \geq 100\%$ | No | N/A |
| Level 1 | $85\% \leq x < 100\%$ | Yes | 5% |
| Level 2 | $70\% \leq x < 85\%$ | Yes | 10% |
| Level 3 | $55\% \leq x < 70\%$ | Yes | 15% |
| Level 4 | $x < 55\%$ | Yes | 25% |

40. Similar to commenters' proposals, the framework the Bureaus and OET adopt resembles

the non-compliance framework for interim deployment milestones in section 54.320(d) of the Commission's rules. The Bureaus and OET emphasize that the goal of this compliance framework is to provide incentives, rather than penalize. Balancing commenters' concerns regarding the severity or leniency of a such a framework, the Bureaus and OET conclude that its framework appropriately encourages carriers to come into full compliance and offer, in areas requiring high-cost support, broadband service meeting standards consistent with what consumers typically experience.

41. Finally, the Bureaus and OET provide one exception to this non-compliance framework. As discussed in this document, carriers that serve 50 or fewer subscribers in a state and particular service tier but cannot find five active subscribers for conducting the required testing may test non-CAF-supported active subscriber locations to the extent necessary. Because those carriers' test results would not solely reflect the performance of CAF-supported locations, any such carriers not fully complying with the Bureaus and OET latency and speed standards will be referred to USAC for further investigation of the level of performance at the CAF-supported locations.

42. The Commission requires that providers subject to these testing requirements annually certify and report the results to USAC, which may audit the test results. To facilitate compliance monitoring, the Bureaus and OET require providers to submit speed and latency test results, including the technologies used to provide broadband at the tested locations, for each state and speed tier combination in addition to an annual certification in a format to be determined by WCB; high-latency bidders conducting MOS testing across their entire networks, rather than state-by-state, may submit and certify MOS test results on a nationwide basis. To minimize the burden on providers, USAC will calculate the compliance percentages required using the data submitted. By requiring carriers to submit test results annually, or quarterly if they are not fully in compliance with the Bureaus and OET standards, and having USAC perform the compliance calculations, the Bureaus and OET minimize the potential for any manipulation or gaming of the testing regime, as providers will be required to certify to a set of specific results rather than to a general level of compliance. Because of the need to develop a mechanism for collecting the testing data and obtain Paperwork Reduction Act (PRA) approval, carriers will be required

to submit the first set of testing data and accompanying certification by July 1, 2020. This submission should include data for at least the third and fourth quarters of 2019. Subsequently, data and certifications will be due by July 1 of each year for the preceding calendar year. WCB will provide further guidance by public notice regarding how carriers will submit their testing data and certifications. Together with USAC audits and possible withholding of support, the Bureaus and OET believe these measures will provide ample incentives for carriers to comply with their obligations.

V. PROCEDURAL MATTERS

A. Paperwork Reduction Act

43. This Order contains new or modified information collection requirements subject to the Paperwork Reduction Act of 1995 (PRA), Public Law 104-13. It will be submitted to the Office of Management and Budget (OMB) for review under section 3507(d) of the PRA. OMB, the general public, and other Federal agencies will be invited to comment on the new or modified information collection requirements contained in this proceeding. In addition, the Commission notes that pursuant to the Small Business Paperwork Relief Act of 2002, Public Law 107-198, see 44 U.S.C. 3506(c)(4), it previously sought specific comment on how the Commission might further reduce the information collection burden for small business concerns with fewer than 25 employees. In this present document, the Commission has assessed the effects of the new and modified rules that might impose information collection burdens on small business concerns, and find that they either will not have a significant economic impact on a substantial number of small entities or will have a minimal economic impact on a substantial number of small entities.

B. Congressional Review Act

44. The Commission will send a copy of this Order to Congress and the Government Accountability Office pursuant to the Congressional Review Act, see 5 U.S.C. 801(a)(1)(A).

45. As required by the Regulatory Flexibility Act of 1980 (RFA), as amended, an Initial Regulatory Flexibility Analysis (IRFA) was incorporated in the USF/ICC Transformation FNPRM, 76 FR 78384, December 16, 2011. The Commission sought written public comment on the proposals in the

USF/ICC Transformation FNPRM, including comment on the IRFA. The Commission did not receive any relevant comments on the USF/ICC Transformation FNPRM IRFA. This present Final Regulatory Flexibility Analysis (FRFA) conforms to the RFA.

46. As a condition of receiving high-cost universal service support, eligible telecommunications carriers (ETCs) must offer broadband service in their supported areas that meets certain basic performance requirements. ETCs subject to broadband performance obligations must currently offer broadband with latency suitable for real-time applications, such as VoIP, and meet a minimum speed standard of 10 Mbps downstream and 1 Mbps upstream or greater. Recipients of high-cost support must also test their broadband networks for compliance with speed and latency metrics and certify and report the results to the Universal Service Administrative Company (USAC) and the relevant state or tribal government on an annual basis, with those results subject to audit.

47. In the Order, the Bureaus and OET define how ETCs with Connect America Fund (CAF) Phase II, Alternative Connect America Cost Model (A-CAM), rate-of-return mandatory buildout, rural broadband experiment (RBE), or Alaska Plan obligations must test speed and latency and certify and report the results. Specifically, the Bureaus and OET establish a uniform framework for measuring speed and latency performance. The Bureaus and OET permit three testing methods as options for ETCs to conduct the required speed and latency tests, and the Bureaus and OET provide a definition for a “test” in this context and specify the measurement span associated with these tests. The Bureaus and OET establish specific test parameters for latency and speed, including how often and how many tests must be conducted and the minimum test sample size. The Bureaus and OET also establish voice testing requirements for high-latency bidders in the CAF Phase II auction. Finally, the Bureaus and OET define compliance for latency and speed standards and establish the required certifications, as well as a compliance framework providing strong incentives for ETCs to meet its standards.

48. With the testing framework the Bureaus and OET have adopted herein, they have provided maximum flexibility to reduce the burden on smaller entities, consistent with ensuring that these carriers are meeting their latency and speed requirements. Smaller entities required to do testing can

choose from one of three methodologies to conduct the required testing. All entities providing broadband service should already use testing mechanisms for internal purposes, such as ensuring that customers are receiving the appropriate level of service and troubleshooting in response to customer complaints. In addition, the Bureaus and OET will be providing an online portal so entities can easily submit all of their test results electronically and USAC will do all of the necessary compliance calculations.

49. The RFA directs agencies to provide a description of, and where feasible, an estimate of the number of small entities that may be affected by the proposed rules, if adopted. The RFA generally defines the term “small entity” as having the same meaning as the terms “small business,” “small organization,” and “small governmental jurisdiction.” In addition, the term “small business” has the same meaning as the term “small-business concern” under the Small Business Act. A small-business concern” is one which: (1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the Small Business Administration (SBA).

50. The Bureaus and OET actions, over time, may affect small entities that are not easily categorized at present. The Bureaus and OET therefore describe here, at the outset, three broad groups of small entities that could be directly affected herein. First, while there are industry specific size standards for small businesses that are used in the regulatory flexibility analysis, according to data from the SBA’s Office of Advocacy, in general a small business is an independent business having fewer than 500 employees. These types of small businesses represent 99.9 percent of all businesses in the United States which translates to 28.8 million businesses.

51. Next, the type of small entity described as a “small organization” is generally “any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.” Nationwide, as of August 2016, there were approximately 356,494 small organizations based on registration and tax data filed by nonprofits with the Internal Revenue Service (IRS).

52. Finally, the small entity described as a “small governmental jurisdiction” is defined generally as “governments of cities, counties, towns, townships, villages, school districts, or special districts, with a population of less than fifty thousand.” U.S. Census Bureau data from the 2012 Census

of Governments indicates that there were 90,056 local governmental jurisdictions consisting of general purpose governments and special purpose governments in the United States. Of this number there were 37,132 General purpose governments (county, municipal and town or township) with populations of less than 50,000 and 12,184 Special purpose governments (independent school districts and special districts) with populations of less than 50,000. The 2012 U.S. Census Bureau data for most types of governments in the local government category shows that the majority of these governments have populations of less than 50,000. Based on this data the Bureaus and OET estimate that at least 49,316 local government jurisdictions fall in the category of “small governmental jurisdictions.”

53. In the Order, the Bureaus and OET establish for high-cost support recipients serving fixed locations a uniform framework for measuring speed and latency performance and define the requisite standards for full compliance with those providers’ speed and latency obligations. The Commission’s existing rules require that high-cost recipients report “[t]he results of network performance tests pursuant to the methodology and in the format determined by the Wireline Competition Bureau, Wireless Telecommunications Bureau, and the Office of Engineering and Technology” and that ETCs retain such records for at least ten years from the receipt of funding.

54. The Bureaus and OET now provide some color to this requirement; they require providers to submit speed and latency test results, including the technologies used to provide broadband at the tested locations, for each state and speed tier combination in addition to an annual certification in a format to be determined by WCB. High-latency bidders conducting mean opinion score (MOS) testing across their entire networks, rather than state-by-state, may submit and certify MOS test results on a nationwide basis. To minimize the burden on providers, USAC will calculate the compliance percentages required using the data submitted. By requiring carriers to submit test results annually and having USAC perform the compliance calculations, the Bureaus and OET minimize the potential for any manipulation or gaming of the testing regime, as providers will be required to certify to a set of specific results rather than to a general level of compliance. However, providers that are not fully compliant with the speed and latency standards must submit quarterly reports including one week of test results and describing steps

taken to resolve the compliance gap.

55. The RFA requires an agency to describe any significant alternatives that it has considered in reaching its proposed approach, which may include (among others) the following four alternatives:

(1) the establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities; (2) the clarification, consolidation, or simplification of compliance or reporting requirements under the rule for small entities; (3) the use of performance, rather than design, standards; and (4) an exemption from coverage of the rule, or any part thereof, for small entities. The Bureaus and OET have considered all of these factors subsequent to receiving substantive comments from the public and potentially affected entities. The Wireline Competition Bureau, Wireless Telecommunications Bureau, and Office of Engineering and Technology have considered the economic impact on small entities, as identified in any comments filed in response to USF/ICC Transformation FNPRM and IRFA, in reaching its final conclusions and taking action in this proceeding.

56. In the Order, the Bureaus and OET adopt a clear, uniform framework for high-cost support recipients serving fixed locations to test speed and latency to meet the obligations associated with the support they receive. The requirements the Bureaus and OET adopt provide flexibility for carriers to choose between different testing methods suitable for carriers of different sizes and technological sophistication. Instead of requiring providers to invest in and implement new internal systems, the Bureaus and OET permit providers to perform speed and latency tests with readily available off-the-shelf solutions or existing MBA infrastructure. The Bureaus and OET expect that carriers with testing features built into customer premises equipment for their own network management purposes may prefer using their own self-testing systems, which they also permit.

57. The Bureaus and OET require that carriers, regardless of their preferred testing methods, conduct tests using the same parameters they establish. These parameters take into account smaller carriers' circumstances to avoid disproportionately burdening them. For example, the Bureaus and OET expand the list of locations to which carriers may conduct required tests—allowing smaller carriers that are farther from the largest metropolitan areas to test speed and latency over shorter distances. The

Bureaus and OET also permit providers to conduct tests to the designated area of their choosing, rather than to the nearest designated metropolitan area. Further, carriers with fewer subscribers in a state and broadband service tier may test fewer locations. Greater percentages of subscribers are necessary to achieve the same margin of error and confidence level in smaller sample sizes, but the Bureaus and OET recognize that, below 450 subscribers, that necessary percentage rises quickly above 10 percent. Accordingly, in the Order, the Bureaus and OET allow providers with between 51 and 450 subscribers in a particular state and service tier combination to test 10 percent of total subscribers. The Bureaus and OET require providers with fewer than 50 subscribers in a particular state and service tier combination to test five locations, but, to the extent necessary, those carriers may test existing, non-CAF-supported active subscriber locations to satisfy that requirement.

58. Finally, the Bureaus and OET provide clarity regarding the Commission's existing requirement that carriers must report the results of network performance tests. Carriers must annually (or, in some cases, quarterly) submit detailed results of the required tests, conducted pursuant to the parameters the Bureaus and OET establish. The Bureaus and OET hold all carriers to the same speed and latency test standards, but they recognize that requiring carriers to take the additional step of using their test results to determine their level of compliance may entail unnecessary burdens. Although the Bureaus and OET anticipate that carriers will find the adopted compliance framework straightforward, they conclude that requiring submission of the actual test results and allowing USAC to calculate the compliance percentages lessens the burden on small entities even further.

VI. ORDERING CLAUSES

59. Accordingly, IT IS ORDERED that, pursuant to sections 1, 4(i), 5(c), 201(b), 214, and 254 of the Communications Act of 1934, as amended, and section 706 of the Telecommunications Act of 1996, 47 U.S.C. 151, 154(i), 155(c), 201(b), 214, 254, 1302, §§ 0.91 and 0.291 of the Commission's rules, 47 CFR 0.91, 0.291, and the delegations of authority in paragraph 170 of the USF/ICC Transformation Order, FCC 11-161, this Order IS ADOPTED, effective thirty (30) days after publication of the text or summary thereof in the Federal Register, except for the requirements in paragraphs 38 and

42 that are subject to the PRA, which will become effective upon announcement in the Federal Register of OMB approval of the subject information collection requirements.

FEDERAL COMMUNICATIONS COMMISSION.

Kris A. Monteith,
Chief, Wireline Competition Bureau.

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